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Does Crown Financial Portfolio Composition Matter?

Nick Davis

Abstract

This paper considers Crown financial portfolio composition from a welfare perspective. It argues that a broad definition of the Crown's portfolio is required for analysing the welfare implications of portfolio composition. In practice, this means incorporating the present discounted value of tax and expenditure flows as well as traditional measures of assets and liabilities. Financial portfolio composition affects welfare for a number of reasons: imperfect and incomplete markets; distortionary taxes; externalities; and agency problems. There is unlikely to be a single policy objective for choosing the preferred portfolio composition that integrates all of those factors. However, it is argued that the Crown should be risk averse and aim to eliminate all diversifiable risk in its portfolio. There is a reasonable case for adopting a low-risk Crown portfolio. Importantly, that does not necessarily require a low-volatility financial portfolio.

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Introduction*

The Crown's financial portfolio has changed significantly over the last decade. In particular, there has been a sharp reduction in the Crown's net financial liabilities due to a steady decline in gross debt and a steady rise in gross financial assets. In terms of composition, the most important changes were a sharp reduction in foreign-currency debt and a rapid increase in student loans. Marketable securities and institutionally managed assets (eg, assets managed by Crown financial institutions, such as the Government Superannuation Fund) have also grown steadily.

With the establishment of the New Zealand Superannuation Fund (NZSF), the Crown is expected to continue to accumulate financial assets faster than the growth in gross debt. The composition of the Crown's financial portfolio is also expected to change significantly over the next decade. While equities currently represent a very small proportion of the Crown's financial asset portfolio, the NZSF is expected to invest a large part of its portfolio in this asset class.

The shift away from a balance sheet dominated by *physical* assets and debt, towards one dominated by *financial* assets raises a number of policy questions. For example, what is the Crown's tolerance for risk?; how should Crown risk be measured?; in what asset classes should the Crown invest?; what are the implications for the volatility of the fiscal aggregates?; and what policy levers does the Government have for managing the composition of its financial portfolio?

Those questions are important because the composition of the Crown's portfolio may impact on:

- Returns: on a financial asset portfolio of $20 billion, a 0.1% improvement in returns represents a saving of $20 million per annum. Similarly, a 0.1% reduction in the risk premium on Government debt would save the Crown in excess of $30 million per annum, as well contributing to lower interest rates for private sector borrowers;

- Fiscal resilience: a fiscal position that is less susceptible to shocks can reduce uncertainty, encourage longer-term planning by individuals and businesses, and improve welfare by enabling individuals to smooth consumption better; and

- Risk-sharing: through innovative debt management, the Crown might be able to improve the way that risks are shared within the economy and between generations.

This paper represents a step towards answering some of the policy questions raised above. In particular, it focuses on whether changes in the Crown's financial portfolio affect individuals' welfare. In the following sections, we define the Crown's portfolio, its composition, and discuss why portfolio composition matters from a welfare perspective.

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What Is The Crown's Portfolio and How Is It Composed?

The Crown consists of a myriad of organisations[1] which are tasked with many different responsibilities (eg, implementing monetary policy, collecting taxes, making transfer payments, providing goods and services, and running successful businesses). These activities have financial implications, such as generating revenues, expending resources, incurring liabilities, and investing in assets. In aggregate, these financial flows and stocks convey information about the state of the Crown's finances. The *Crown's Portfolio* can be thought of as a measure of the Crown's financial position at a point in time.

One example of such a measure is the Crown's Balance Sheet. Since 1991, the New Zealand Government has published a Statement of Financial Position in accordance with generally accepted accounting practice (GAAP).[2] Consistent application of GAAP-based recognition criteria ensures a rigorous and comparable measure of the Crown's financial position over time. The Crown's reported net worth (RNW) can be represented as follows:

$$RNW_t = A_t^{WC} + A_t^{PHYS} + A_t^{FIN} + A_t^{OTHER} - L_t^{CCY} - L_t^{BRW} - L_t^{OTHER}$$

Where:

RNW_t	=	Reported Net Worth or Net Equity at time t
A_t^{WC}	=	Working Capital (eg, receivables/payables and inventories)
A_t^{PHYS}	=	Physical Assets (eg, land and buildings)
A_t^{FIN}	=	Financial Assets (eg, stocks and bonds)
A_t^{OTHER}	=	Other assets (eg, non-tradable investments and intangibles)
L_t^{CCY}	=	Currency in circulation
L_t^{BRW}	=	Gross Debt
L_t^{OTHER}	=	Other Liabilities (eg, pension liabilities and ACC liabilities)

Another measure of the Crown's financial position is Comprehensive Net Worth (CNW). Bradbury et al (1999) developed CNW as a broad measure of the Crown's financial position. It is based on the traditional inter-temporal budget constraint, expressed in terms of a GAAP-type accounting framework. The measure is broader than RNW because it incorporates the present discounted value of all future revenue and expenditure flows, based on "existing" policies. Using a residual income approach, McCulloch (1997) shows that CNW can be presented as follows:

$$CNW_t = RNW_t + \sum_{i=1}^{\infty} \frac{1}{(1+r)} E_t[ROB_{t+i}]; \text{ where } ROB_t = OB_t + R_t^{PHYS} - r.RNW_{t-1}$$

Where:

CNW_t	=	Comprehensive Net Worth
RNW_t	=	Reported Net Worth from the Statement of Financial Position
r	=	Discount rate for cash flow
ROB_t	=	Residual Operating Balance
OB_t	=	Operating Balance from the Statement of Financial Performance
R_t^{PHYS}	=	Revaluations of physical assets

[1] The Public Finance Act 1989 defines the Crown as Ministers of the Crown, Government departments, Offices of Parliament, Reserve Bank of New Zealand, State-Owned Enterprises, and Crown entities.

[2] Refer to the *Financial Statements of the Government of New Zealand* published monthly by the Treasury and available at http://www.treasury.govt.nz/financialstatements/

While CNW encapsulates the financial impact of all past and expected future Crown activities, its measurement is subject to considerable uncertainty. Grimes (2001) notes that the information required to measure CNW is "massive and realistically the quality of much of this information will be tenuous at best". This limits the usefulness of CNW as a measure of fiscal sustainability and as a basis for making policy decisions.

Of course the purpose for which the measurement is being obtained should be a key consideration in deciding which measure to use. For example, if you are interested in the Crown's short-term financial performance over time, then changes in RNW measured at appropriate intervals would provide the information required. On the other hand, if you are interested in fiscal sustainability or intergenerational equity, then some broader measure is likely to be preferred.

For analysing the welfare-impact of Crown portfolio composition, a dynamic, long-term and inclusive measure of the Crown's portfolio is required. That is because individuals are exposed to the Crown through the taxes they pay, the transfers they receive, and the public goods and services they consume. Moreover, their welfare today is dependent on their future exposure to the Crown. The Crown, as an infinitely-lived institution, should also consider the impact of its actions today on the welfare of future generations.

For the purposes of this paper, the definition of the *Crown's portfolio* should be complex enough to incorporate the richness of the Crown's activities over time, while being simple enough to be measured with some degree of confidence. On balance, a sensible strategy may be to adopt a measure of the Crown's portfolio that is broader than RNW but which, in all likelihood, is narrower than CNW. Important criteria for determining inclusion of assets and liabilities should be materiality, measurability, and forecastability.[3]

In compositional terms, the Crown's portfolio is likely to consist of revenue and expenditure flows, as well as stocks of assets and liabilities. The former can be put on a consistent basis with the latter by discounting the future flows to their present value. Hence, the Crown's portfolio might include measures of its tax asset and education and health liabilities, alongside its physical assets and net financial liabilities.

Some of the Crown's assets and liabilities can be managed with more flexibility than others. For example, assets and liabilities held to facilitate the provision of public goods and services (eg, schools, hospitals and national parks) can be considered constraints to the Crown's portfolio, at least in the short term. Other assets and liabilities, such as those that arise as a result of timing mismatches between revenues and expenditures, can be managed with considerable flexibility, since they tend to be marketable securities and are not tied to any one purpose. In between these two extremes are assets and liabilities, such as student loans, SOEs, and pension liabilities, that could feasibly be sold but might be deliberately retained.

This paper focuses on whether changes in the Crown's financial portfolio affect individuals' welfare. While excluding non-financial assets and liabilities constrains the policy analysis (ie, by limiting the policy levers available to the government), it does so without any loss of generality. Non-financial assets and liabilities are not ignored; rather they are explicit constraints to the Crown's portfolio.

[3] It is worth emphasising that any measure of the Crown's portfolio is likely to be partial and will need to be supplemented with qualitative information on excluded items.

Does Financial Portfolio Composition Matter?

Since the Government is able to choose the composition of its financial portfolio with considerable flexibility, we should consider whether financial portfolio composition affects individuals' welfare. The hypothesis adopted in this paper is that Crown financial portfolio composition does have welfare implications. However, to be explicit about the reasons for 'caring' about compositional issues, we must consider the circumstances in which Crown financial portfolio composition would be irrelevant.

An Irrelevance Theorem of Financial Portfolio Management

The irrelevance of financial portfolio management is an extension of Ricardian Equivalence.[4] The Ricardian Equivalence proposition is that government deficits do not matter for individual welfare because private citizens anticipate the fact that current borrowing has to be repaid later, and thus increase their personal saving. In essence, individuals can unravel the effect of government decisions to tax or borrow [Barro 1974]. Extending that concept to the neutrality of financial portfolio management: for any change in the composition of the government's financial portfolio, individuals are able to offset any government action by changing the composition of their own portfolios.

Both the neutrality of the tax-borrowing decision, and that of the balance sheet composition decision, are underpinned by very restrictive assumptions. Those assumptions can be summarised by the *Irrelevance Theorem of Financial Portfolio Management*:[5]

> Given current taxes and an exogenous path for public spending, public financial portfolio management does not affect the real allocation of resources if:
>
> (i) Individuals are rational;
> (ii) Current generations fully incorporate future taxes in their decision-making;[6]
> (iii) The share of future taxes to which each individual is called to contribute is state independent;
> (iv) Capital markets are perfect. In particular, either there are no constraints on short sales of public assets or perfect private substitutes exist;
> (v) Private asset markets are complete or, if they are incomplete, no new debt instrument is introduced that did not exist in the initial equilibrium;
> (vi) The use of debt cannot create value (eg, Ponzi games are not viable); and
> (vii) Taxes do not distort incentives, for example, taxes are lump sum.

[4] The conditions for balance sheet management neutrality are somewhat less restrictive than the conditions for Ricardian Equivalence, since changes in balance sheet composition do not affect the current mix of tax and spending (see Missale 1998, ch 2).

[5] This is an adaptation of Missale's (1998) theorem of debt-management neutrality.

[6] This typically requires current generations to be linked to future generations through completely altruistically motivated transfers.

Why does financial portfolio composition matter?

The irrelevance theorem forces a rigorous analysis of the reasons why financial portfolio composition affects individuals' welfare. All of the assumptions required for irrelevance of financial portfolio management are simplistic. The following discussion considers the implications of departures from those assumptions for financial portfolio management.

… because citizens may not be able to manage their exposure to the Crown

In an economic environment in which the Crown is susceptible to shocks, individual citizens effectively own a *risky* tax liability.[7] That derives from the simple insight that all government spending must be paid for out of current public assets (debt) and current and future taxes. If the Government sets taxes to just meet its current and future commitments, unforeseen permanent shocks to public expenditure or Crown net worth will require corresponding adjustments to current and/or future tax rates.[8]

Furthermore, the tax liability is coerced, non-marketable and its value will vary with changes in the Crown's financial position. Despite that, individuals may be able to 'trade' the risk inherent in the liability by constructing partially offsetting financial portfolios. In fact, if markets were complete and frictionless, individuals could perfectly offset the volatility in their tax liability without cost. In such circumstances, there would be no need whatsoever for governments to undertake financial management, making questions about Crown financial portfolio composition irrelevant.

In reality markets are incomplete and costly, and individuals cannot fully offset the volatility in their tax liabilities (ie, instruments that mimic individuals' tax liabilities do not exist). Therefore, some of the risk inherent in individuals' tax liabilities is systematic[9] and non-diversifiable. Because some individuals may have less ability to hedge this risk than others (eg, due to liquidity constraints or high transaction costs), there exists a *prima facie* case for the Crown to manage its portfolio to achieve the risk exposure desired by those individuals with limited market access.

Wheeler (1996) argued that the New Zealand government should adopt a low-risk portfolio of net liabilities consistent with the Government's aversion to risk. In particular, three main considerations underpin the Government's preference for low-risk portfolio management:

- Evidence suggests that individuals or, more relevant in a public choice context, 'median voters', tend to be risk averse in their decision-making and expect the Government to reflect this preference in managing its interests;

- Losses incurred in the Government's portfolio impose costs which most taxpayers are unable to avoid. Taxpayers have limited practical scope to foresee and undo the consequences of poor financial decisions by the Government. Risk-averse policies reduce the risk of surprises, providing greater certainty for planning; and

[7] Government transfer payments add complexity to this story. Some taxpayers, for example, are likely to be net recipients from government. However, this added complexity does not eliminate the link between taxes and welfare.

[8] The assumption is that public expenditure is exogenously determined by Government and is not altered in response to shocks. The implications of endogenous expenditure are discussed later.

[9] Systematic risk is a measure of the covariance between asset returns and the economy.

- The Government does not have a competitive advantage over other market participants in attempting to derive excess returns from its portfolio management, except for its privilege as a tax and regulation-exempt institution and internal information on the fiscal situation or government policy objectives. However, the NZDMO considers that the exploitation of these exemptions is unethical.

Wheeler's argument relies on the transmission mechanism being a complete pass through of the effects of government financial policy to individuals. For example, assume that the government holds a portfolio that is efficient in the Markowitz sense (ie, all unsystematic risk has been eliminated through diversification). Then, under Wheeler's assumptions, a proportional increase in the government's holding of risky assets increases the riskiness of private citizens' portfolios.

In practice the transmission mechanism is likely to be far more complex. Individual citizens' risk exposure to Crown portfolio decisions is affected by taxes, transfers and the myriad of insurance and other services provided by the Crown. The Crown's tax and expenditure flows are expected to have implications for the desired risk characteristics of its financial portfolio. For example, a risky net debt portfolio may contribute to a low-risk Crown financial position due to natural hedges or diversification benefits.[10]

Those arguments do not necessarily weaken the argument that the Crown should have a low tolerance for risk. It merely changes the focus of the analysis, from net liabilities to some broader measure of the Crown's financial position. It remains that individual citizens will have different risk exposures to the Crown and will have differing abilities to offset those exposures. It is also plausible that wealthy individuals are likely to be better equipped to manage that exposure themselves.

There are, however, other factors that weaken the arguments for pursuing a deliberate low-risk policy on behalf of some representative individual:[11]

- The size of individuals' relative exposure to the Crown is an empirical issue. Low financial worth citizens are likely to be a net recipient from the Crown, whereas high financial worth individuals are likely to be net contributors. Campbell (1996) argued that human capital represents approximately two thirds of individuals' total wealth. It has not been shown that the 'representative individual' has a large and unmanageable exposure to the Crown;[12]

- Since risk aversion is not an absolute position, the Crown would need to identify the risk preferences of the 'representative' individual. This is impossible since each individual has different risk exposures; faces a different set of efficient portfolios; has different risk preferences; and has different abilities to construct offsetting portfolios. Furthermore, individuals' tolerance for Crown risk exposure may increase with improvements in the Crown's financial position; and

- Explicitly targeting a low-risk portfolio would represent a redistribution of wealth risk between individuals.[13] Given the difficulties in measuring the relationship between

[10] Automatic fiscal stabilisers are another example of how governments smooth the effects of cyclical volatility on the fiscal position (see, for example, Fowlie (1999)).

[11] The following draws heavily on Skilling (1997).

[12] Governments attempt to smooth policy settings over time. Even if the Crown's financial position is volatile, individuals' exposure to the Crown may be limited [Skilling, 1997].

[13] Any change in Crown risk tolerance is expected to have re-distributive consequences.

> Crown financial operations and individual welfare, it may be that more direct forms of redistribution could be more effective, flexible, and transparent than deliberately pursuing a low-risk Crown portfolio (eg, the Crown already provides a range of social insurance services to citizens).

In summary, liquidity constraints and transaction costs mean that some individuals may have less ability to hedge their tax liabilities than others. Consequently, there may be a role for the Crown to manage its portfolio to achieve the risk exposure desired by those individuals with limited market access. However, it is not clear how the Crown could identify the desired degree of risk-aversion, or whether the welfare effect of different portfolio choices is material. A conservative approach suggests that the Crown should have a low tolerance for portfolio risk. However, this would represent a re-distribution of wealth risk. Managing portfolio composition is unlikely to be an efficient means of pursuing re-distributive goals and, even if it were, a low risk Crown portfolio does not necessarily imply a low-volatility financial portfolio.

… because missing insurance markets limit risk-sharing

Missale (1997) explains that incomplete asset markets, and thus the existence of unexploited insurance opportunities, allow the possibility of improving risk-sharing and, hence, welfare through debt management policy. In particular, the government's choice of financial portfolio composition may contribute to improving the allocation of risk between generations or between investors and taxpayers.

By issuing state-contingent securities, the government can expand individuals' investment opportunities and improve risk sharing. For example, public debt provides insurance to citizens by offering a safe asset which is a claim on the next generation. In an infinite horizons model, all generations are better off since each generation is providing insurance to the preceding generation.[14]

That suggests that the impact on inter-generational risk-sharing should be important when considering changes to the Crown's financial portfolio. Unfortunately, the literature on the interaction between government portfolio choice and inter-generational welfare is inconclusive.

Allen and Gale (1990) argue that issuing a tiny amount of a new security has a large impact on risk-sharing, while a large change in the amount of an existing security has no impact. However, that asymmetry relies on the assumption that investors can take unlimited short positions in government securities. As soon as short sales are constrained, the discontinuity disappears.

Fischer (1983) explains that the effect on risk allocation of introducing new securities is jointly-determined by the government's tax policy. As the introduction of new securities may change the distribution of taxes across future states of the world, the effect on risk allocation is dependent on how taxes will change and who will be liable for paying them. Assuming that tax policy is a higher-order policy decision than financial portfolio composition, it is plausible that the impact of portfolio composition on inter-generational

[14] Another example is the provision of insurance against business cycles. Since macroeconomic shocks tend to affect most asset returns in a similar way, it may be difficult for investors to insure themselves against the effects of the cycle. The government may be able to offset this risk by issuing securities inversely related to the market portfolio (Pagano, 1988).

risk sharing is weaker than the impact of tax policy. However, the effect of portfolio composition may still be material if the government's financial portfolio is large.

Bohn (1998) provides an example of how tax policy can unravel the impact of public securities on risk-sharing within an overlapping generations model with stochastic production. If the government issues safe debt, it provides safety to the current old. However, future generations will face an increase in volatility of after-tax incomes since they have to pay a non-contingent debt service out of stochastic income. Issuing safe debt will not always increase welfare because it increases the deadweight costs of taxation.

Grimes (2001) highlights an implication of Bohn's approach: governments should seek to structure their net financial liabilities (assets) so that liability service rises (asset returns fall) when pre-tax incomes (productivity) rise. In other words, if the government is holding net financial assets it should be investing in assets that are negatively correlated with domestic incomes. If it has net financial liabilities, it should issue debt with returns positively related to domestic incomes. However, Grimes acknowledges that this extension of Bohn's analysis ignores the implications of distortionary taxes.

Pagano (1988) explicitly considered state-contingent securities, suggesting that the government should issue securities that are negatively correlated with the market portfolio. Pagano's argument is that since negatively correlated securities could be sold at a higher price than safe securities, the government would make a profit, allowing it to retire the debt. However, that argument ignores the implications for different generations' tax liabilities and the impact on asset prices.

Shiller (1993) proposed a new set of markets that could in theory provide much better diversification opportunities than are available in existing financial markets. These so-called macro markets would be large international markets trading long-term claims on aggregate national incomes. Athanasoulis, Shiller and van Wincoop (1999) find that the benefits of eliminating exposure to country specific risk are large and existing markets do not provide a good substitute for macro markets. However, there are serious practical obstacles to introducing macro markets, including lack of investor awareness, measurement problems and difficulties in designing enforceable contracts.

Finally, Bohn (2001) considers the role of fiscal policy in determining the aggregate allocation of risk within the context of an aging society with over-lapping generations. He demonstrates that, as the population ages, state-contingent government bonds are better risk-sharing tools than pensions, which become too costly, or taxation, which raises time-consistency concerns. In particular, wage-indexed and longevity-indexed bonds yield unambiguous efficiency improvements. Pension policy provides additional degrees of freedom if pensions are partially pre-funded and if the "trust fund" is invested in capital assets (eg, equities).

In considering if there is a role for government financial innovation, it should be noted that markets may be "missing" because of high transaction costs and/or imperfect information. The government is not immune to those constraints so it is not sensible to assume that it can issue any security without cost. In fact, unless the government has a cost or information advantage, there is likely to exist a trade-off between the cost of intervention and the expected gains from more efficient risk-sharing. Furthermore, the efficacy of innovative debt management will need to be assessed within the context of other government policies that affect risk-sharing (eg, social security and tax system design).

A clearer insurance role for government securities emerges when idiosyncratic risk (eg, taste or liquidity shocks) is considered, as opposed to macroeconomic risk. Policies which provide insurance against idiosyncratic risk have, at first approximation, no adverse consequences in terms of taxation (Missale, 1997). For example, efficient secondary markets for government securities provide liquidity and information that private security markets cannot offer because of imperfections and/or externalities.

That suggests the liquidity of government securities can be as important as their stochastic characteristics, implying there are gains from issuing large amounts of standardised securities and costs associated with introducing 'new' public securities.[15] The 'high' costs of introducing new securities limit diversification in the menu of public securities and suggest that innovation in the inherited financial structure can be difficult. Countries with small economies, in particular, may find these costs prohibitive due to the absence of economies of scale and less liquid financial markets.

In summary, theory suggests a role for government to facilitate risk-sharing in the economy and across generations. However, the effect of Crown financial portfolio composition on inter-generational risk-sharing is tied to the government's tax-borrowing decisions. Furthermore, it is not clear that governments have a comparative advantage over private market participants when it comes to financial innovation. The introduction of new securities is likely to be expensive, particularly in small economies due to an absence of economies of scale and less liquid financial markets. More compelling is the role for governments to provide insurance against idiosyncratic risk. In particular, there seems to be a role for government in promoting secondary market liquidity (eg, by issuing standardised securities). This is expected to improve risk-sharing between investors and taxpayers.

… because taxes distort individual behaviour causing welfare losses

Due to their involuntary nature, taxes create incentives for taxpayers to substitute away from taxed activities toward activities that are not taxed, or are taxed at lower marginal rates. If the taxed activities would otherwise be worthwhile, the substitution reduces welfare and creates a deadweight cost. Hence, taxes should be imposed in a way that minimises the deadweight costs of taxation.

Barro (1979) has shown that, in a deterministic environment with distortionary taxes, governments should smooth tax rates over time. Bohn (1990) explained that Barro's result generalises in an uncertain environment to smoothing tax rates over states of nature:

> "If there are shocks that affect the government budget, government liabilities should provide a hedge against these shocks. This characterises the optimal structure of government liabilities." [Bohn, 1990, p. 1217]

If markets are complete and if the government can trade on all markets, the tax rate should not change. That is because the government could issue state contingent debt with returns inversely related to all conceivable shocks to government assets and liabilities. In practice markets are incomplete and, even if they were complete, it might

[15] The gains (costs) manifest in reductions (increases) in the liquidity premium on government debt.

not be credible for the government to operate on all markets.[16] For example, governments tend to issue conventional securities (eg, nominal debt) rather than securities indexed to government spending.

Bohn (1990) showed that governments can reduce the deadweight costs of taxation using conventional securities even when agents in the economy are risk neutral. In particular, governments should invest in assets and issue liabilities up to the point where the return on each asset/liability is uncorrelated with the tax-rate. The optimal mix of securities in the government's financial portfolio will depend on the interaction between government spending, revenue, and the returns on the financial portfolio. The optimal portfolio is likely to vary from country to country due to differences in governments' tax systems and spending commitments, as well as differences in the way that shocks affect different economies.

Grimes (1992) takes that result further. He shows that even where a risk-averse private sector is able to hedge using the same instruments as government, it is still optimal for government to choose its asset/liability structure so as to hedge its net worth. In particular, he highlights the link between the government's portfolio choice and its decisions regarding the taxation of financial and non-financial income. In order for the government to be able to choose a stable combination of tax rates, it must structure its portfolio to hedge income.

A rarely emphasised implication of the tax-smoothing literature is that the government may be able to eliminate a considerable portion of the volatility in its financial position at very low cost. That is, governments could eliminate unsystematic risk through diversification.[17]

The empirical evidence on tax-smoothing is mixed. Missale (1998) calculates the optimal debt mix for 16 OECD countries over the period 1985-1998.[18] Differences in the sign and relative strength of the relevant co-variances allow for few general conclusions:

- Evidence against foreign currency denominated debt is strong for almost all countries considered. Conversely, this means that foreign currency assets can be expected to have beneficial hedging properties;

- Overall there seems to be more scope for price-indexed debt than is contemplated by actual arrangements. However, evidence on whether price-indexed bonds should be issued instead of nominal bonds varies across countries reflecting the type of shocks that each country experiences; and

- In a number of countries, nominal debt appears to have consistently provided a hedge against output fluctuations. Long-term nominal debt provides insurance against permanent output uncertainty, but its optimal share is small due to the large

[16] For example, the government may be able to issue securities that are contingent on government spending or the tax rate itself. However, if such securities were issued, the government might have an incentive to manipulate the securities' payoffs.

[17] The definition of systematic and non-systematic risk is likely to take on a somewhat different meaning in the government context since some of the risk being eliminated relates to variation in tax and public expenditure flows.

[18] The optimal share of nominal, foreign-currency and price index-linked debt is estimated from the conditional covariances of their returns with permanent output, spending, inflation and the exchange rate. See Leong (1999) for a summary of Missale's findings.

volatility of holding returns. The optimal maturity structure is heavily concentrated in the short-end.[19]

Credit Suisse First Boston (CSFB) (1995) considered both the optimal level and composition of government debt for New Zealand using a tax-smoothing framework adapted for a small open economy.[20] While CSFB did not test their conclusions empirically, their comments on the hedging characteristics of specific securities were as follows:

- There is a strong case for very long-term debt. Long-term debt reduces both the interest-rate sensitivity of the balance sheet and the risk of refinancing public debt;

- There is a strong case against foreign currency debt. Foreign currency debt would exacerbate the adverse effect of exchange rate shocks on government revenues and expenditure.[21] In fact, pure insurance considerations suggest that the government should borrow long-term to finance the accumulation of foreign currency assets;

- Nominal debt could be used to hedge budgetary risks but not if it compromises the credibility of monetary policy.

Fowlie and Wright (1997) use the approach of Bohn (1990) to determine the optimal public debt structure for New Zealand. In contrast to the findings of Missale and others, they find a strong case for foreign currency denominated debt. If foreign currency debt can not be issued, then the government should issue price-indexed debt rather than nominal debt. However, Grimes (2001) points out that these results may be highly dependent on the chosen time period and the country of the study. In an analysis of similar issues for 9 OECD countries, Hawkesby and Wright (1997) find that issuance of domestic short-term debt is generally preferable to issuance of long-term domestic debt, indexed debt or foreign currency debt.

The evidence on tax-smoothing should be interpreted with caution. More confidence can be attached to the direction of the detected relations, rather than to the size of debt shares. Furthermore, relying on past evidence for the choice of debt instruments could be misleading since the relevant co-variances may change depending on the future shocks that the economy experiences. Since shocks are inherently unpredictable, it is difficult to identify the optimal composition in practice.

Methodological issues also limit the applicability of tax-smoothing models for policy-making. First, the models typically ignore financial assets except insofar as optimal debt weights are not constrained to positive values. Moreover, the models tend to make simplistic assumptions (eg, individuals can borrow and lend at the riskless rate). Second, and more problematic, is the implication for optimal policy of endogenous public spending. Pinfield (1998) has shown that tax-smoothing is no longer optimal if government expenditure is plausibly related to the government's overall net worth. Future models will need to take those factors into account for policy-making.

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[19] This may expose the government to considerable re-financing risk (eg, Mexico in the 1990s).

[20] The report, 'Optimal Crown Debt', was prepared by Professor Henning Bohn and Dr Bryce Wilkinson.

[21] CSFB's model suggests that government revenues and the cost of public services are adversely affected by higher import prices resulting from a depreciating currency.

A number of other studies have adopted similar approaches to the tax-smoothing models discussed here. Despite the methodological differences, the different approaches tend to reach similar conclusions to the tax-smoothing models (see Box 1).

BOX 1. Alternative Approaches

In the early 1990s, the NZDMO employed duration theory to explore whether it was feasible to match the structure of the Government's assets with its liability portfolio [Wheeler, 1996]. Despite methodological difficulties, the conclusions of this work were:

- The duration of Crown assets were quite long, implying that the debt portfolio should also have a long duration;
- Some of the Crown's assets were real (ie, generate inflation-indexed cash flows) implying a strong case for inflation-indexed debt; and
- Issuing foreign-currency debt introduced significant variability to the Government's net worth since asset prices were not sensitive to movements in exchange rates.

Huther (1998) applied modern portfolio measures of performance to New Zealand's central government assets and liabilities. Two key observations emerged:

- The Crown's portfolio is inefficient in a Markowitz sense. Therefore the Crown could reduce overall portfolio volatility without reducing the return on its portfolio; and
- Equity investment, particularly in foreign equities, has insurance properties for the Crown.

In summary, distortionary taxes imply that the government should structure its financial portfolio to hedge against shocks to taxes and government expenditure. That requires returns on the financial portfolio to be uncorrelated with tax rates and implies that the government should eliminate unsystematic risk through diversification. The evidence on tax-smoothing suggests that governments should take on net foreign currency asset exposure; issue long-term debt to reduce interest rate sensitivity; and issue price-indexed debt if it is not too costly. However, caution should be adopted in extending the analysis for policy purposes.

… because of differences between internal and external borrowing costs

There is an observed tendency for commercial institutions, both public and private, to exhibit risk aversion when making financial decisions. For example, firms use capital structure, investment policies and hedging to limit the types and quantities of the risks they face. That behaviour is in conflict with classical financial models[22] and until recently has had little normative theoretical support. [23]

Froot and Stein (1998) provide theoretical support for firm risk aversion using an integrated financial model for firms facing non-tradable risks. When there is an

[22] Classical financial theory asserts that a firm does not have an independent risk preference and that financing and investment decisions are separable.

[23] The literature provides many compelling behavioural explanations for the observance of firm risk aversion (eg, the risk aversion of boards and executives).

increasing cost to raising external funds, a firm's optimal capital structure, investment decision and risk tolerance are endogenous. That is because firms face a trade-off between the costs of raising new external finance and the costs of holding a buffer of equity capital on the balance sheet. Given those frictions a firm should:

- hedge any risks that can be offloaded on fair market terms;
- hold a limited amount of capital as a device for absorbing illiquid risks; and
- value illiquid risks according to their impact on portfolio risk and return with the degree of risk aversion being a decreasing function of the amount of capital held.

Huther (1999) argues that the Crown faces similar trade-offs to private firms: internal and external financing costs differ when the total costs of taxation (including deadweight costs) are not the same as the total cost of borrowing (interest and the costs of future taxation). This is likely because it is generally accepted that the deadweight costs of taxation are convex and rise with the tax rate, and borrowing costs rise at an increasing rate with the level of borrowing. For a government, the practical implications of this model are:

- the government's aversion to financial risk is endogenous to the composition of its portfolio and the investment opportunities available to it;
- government risk aversion does not fall neatly into the category of risk minimisation or risk neutrality.[24] Instead, governments should weigh the costs of holding reserves against the costs of increased borrowing if financial returns are less than expected;
- the level and composition of the government's financial asset portfolio depends on both the government's borrowing capacity and the likely correlation between portfolio performance and the government's financing requirement.

The results of the model are reasonably intuitive. When there are significant stocks of financial assets on the Crown's balance sheet, or there is capacity to borrow, shocks can be readily absorbed within the balance sheet and the Crown is likely to be able to bear more risk than if the Crown had high levels of gross debt and faced a substantial risk premium on its borrowings. It should be noted that the model is likely to be sensitive to the specification of the government's cost functions.

… because the government is a significant player in the macro-economy

The relative size of the Crown's gross financial assets and liabilities is an important consideration in determining the effect of Crown financial portfolio composition on the New Zealand economy. If the Crown holds a portfolio that is small relative to New Zealand's capital markets, the composition of the Crown's financial portfolio is unlikely to have any significant macro-economic effects. That is because there will be little crowding-out of private sector investment and any inefficient corporate governance will have little economy-wide impact.

However, if the size of the Crown's financial portfolio is large, the composition and quality of national savings could be affected by the investment strategy adopted by the Crown. Furthermore, performance within the macro-economy may be negatively affected if a significant proportion of local investment were to occur, as public Funds

[24] However, both results are optimal solutions under certain simplifying assumptions.

might adopt an active role in the governance of companies and pursue goals that are not consistent with value-maximisation.[25]

The Crown may have a role in reducing the level of aggregate uncertainty in the economy, as uncertainty results in individuals deferring investment[26] which in turn depresses economic activity. To the extent that the Crown's investment activities contribute to an increase in aggregate uncertainty (eg, due to excessive volatility in the Crown's portfolio that is not hedged by individual citizens), there may be a role for the Crown adopting a low-volatility financial portfolio. However, it is likely that the Crown's portfolio would have to be very large relative to the economy before it would have a significant impact on aggregate uncertainty. Lack of transparency, or concerns about fiscal sustainability, would be expected to have a larger impact on aggregate uncertainty.

There are other macroeconomic considerations that suggest constraints around the level of gross debt. For example, in times of fiscal stress, the Crown could face substantial risk premia on its borrowings. That will raise not only the Crown's cost of borrowing, but the cost of capital in the economy more generally. A high cost of capital is expected to depress economic activity both now and in the future. Vicious circles could develop (eg, rising interest rates and depreciating currency) if the depressed economic outlook generated a crisis of investor confidence. That suggests that the government should limit the level of gross debt to prudent levels. However, this issue is about the level of gross debt rather than its composition.

Robinson (1999) considered the phenomena of a shrinking government bond market. A reduction in the amount of government bonds outstanding would reduce liquidity, driving up the bid/offer spreads and the liquidity premium on new debt. However, a decrease in the supply of government bonds would reduce any "crowding out" effects that may be working against other debt markets. Financial innovation could facilitate investor substitution into other bonds (eg, securitisation to enhance the credit standing of private bond programmes). Robinson argues that the Government should be able to manage the reduction of government stock to zero without major disruption to New Zealand financial markets. However, that may require active government policies to maintain transparency, to promote depth and resilience in the secondary market, and to encourage innovation.

In summary, the relative size of the Crown's gross financial portfolio could be a key determinant of its impact on the macro-economy. The potential adverse impact of a large gross asset position could be mitigated by directing investment offshore. In evaluating the welfare impact of changes in the Crown's financial portfolio, it is necessary to consider the impact on aggregate uncertainty; risk premia and the cost of capital; and financial innovation and market liquidity.

… because of inefficient public sector management[27]

The public sector has an observed tendency to act in a relatively inefficient manner due to principal-agent and time-consistency problems. Similar to arguments made by Jensen and Meckling (1976), Crown financial management is expected to become less

[25] See, for example, Romano (1993) and Murphy and Van Nuys (1994).
[26] An increase in uncertainty raises the option-value of waiting (Dixit and Pyndyck, 1994).
[27] This section draws heavily on Davis (1998).

efficient with a rising available level of surplus liquid resources. In practical terms, those potential inefficiencies may manifest in the form of:

- direct "raiding" of the asset portfolio. The fungibility of financial assets increases the potential for governments to expropriate assets for purposes other than originally intended.[28] The probability of "raiding" will also increase to the extent that the assets are not held for a clearly defined purpose;

- less efficient fiscal management. Historical evidence suggests that the level of inefficient public spending and investment rises when public finances are healthy (see Bohn (1991), Alesina and Perotti (1995) and Pinfield (1998)); and

- publicly-managed asset portfolios are expected to underperform comparable privately-managed portfolios due to the potential for multiple and competing objectives (eg, social responsibility rules) and weaker market disciplines.

Davis (1998) argues that some of those potential inefficiencies could be mitigated through institutional design. For example, the Crown could enhance policy credibility and reduce the likelihood of inefficient public asset management by:[29]

- establishing an independent and autonomous authority to be responsible for the efficient management of assets ("the Fund");

- amending the Public Finance Act to entrench a "funds transfer mechanism" so that cash paid to and from the Fund complies with strict budgetary criteria;

- amending the Fiscal Responsibility Act to establish short-run intentions and long-term objectives for the size of the Fund and the levels of transfers to and from it;

- securitising the assets of the Fund to render them less fungible;

- ear-marking the Fund or giving the Fund an appropriate name;[30]

- creating clear and transparent investment objectives, performance measures, reporting requirements and accountability arrangements;

- making an independent investment authority responsible for asset management and holding it accountable for performance;

- employing private sector funds managers, subject to clearly specified investment guidelines and contestable tender processes; and

- applying the same regulatory environment to the Fund as applies to private sector funds, with the possible exception of additional transparency requirements.

While the application of robust institutional arrangements may reduce the problems associated with direct-raiding and inefficient public funds management, it is less clear how the potential for inefficient tax and expenditure decisions could be mitigated. In

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[28] Alchian and Woodward (1987, 1988) consider asset fungibility to be an important consideration in assessing the potential for moral hazard in asset management.

[29] Some of these features are already part of the governance arrangements for various Crown Financial Institutions (eg, NZSF and GSF).

[30] Davis (1998) argued that semantics alone may have a real impact on credibility due to the effect on individuals' perceptions.

the presence of a large financial asset portfolio, the efficiency costs could be material, suggesting that there is a case for constraining the level of Crown gross financial assets. That issue is beyond the scope of this paper.

The rationale for constraining the level of gross financial assets can be extended to the choice of portfolio composition. All other things being equal, a low-returning asset portfolio will limit the future surplus cash flow available to the government compared to a high return portfolio. That suggests a potential reason for the Crown to pursue a low-risk portfolio objective. However, such a policy would have a high opportunity cost in terms of foregone higher expected returns. It is unlikely that the benefits of pursuing a low-risk objective on those grounds would exceed the associated costs.

In summary, principal-agent and time-consistency problems are relevant considerations for portfolio composition policy. However, there does not appear to be a primary role for these issues in shaping the choice of portfolio composition. Whatever portfolio objective is chosen, robust governance arrangements are required to ensure that assets, liabilities and the fiscal position in general are managed in accordance with the government's objectives.

Summary and Conclusion

In considering the impact of Crown portfolio composition on welfare, it is important to be clear on what is meant by the Crown's portfolio. For our purposes, a rich, forward-looking measure of the Crown's financial position is needed. In theory, all future revenues and expenditures, together with current stocks, should be incorporated in a comprehensive measure of the Crown's financial position. In practice, a broader measure of the Crown's portfolio should include only those assets/liabilities that are material and can be reasonably measured.

Under certain conditions, Crown financial portfolio composition is irrelevant and there would be no need whatsoever for governments to undertake financial management. However, the requirements for irrelevance of financial management do not hold in practice. In particular, financial portfolio composition is relevant because:

- citizens may not be able to manage the risk inherent in their tax liabilities and there may be a role for the Crown to manage that risk on taxpayers' behalf;
- missing insurance markets may limit efficient risk-sharing between generations and between investors and taxpayers. Consequently, there may be a role for government to facilitate risk-sharing through innovative financial management;
- tax distortions impose costs on society that governments can reduce by structuring their assets/liabilities to hedge shocks to the balance sheet; and
- differences in tax and debt financing costs imply that the appropriate degree of Crown risk-aversion depends on the strength of the Crown's financial position.

In addition to these primary considerations, balance sheet composition faces constraints due to potential macroeconomic effects and the likelihood of inefficient public sector management. Those factors are considered secondary since they do not imply obvious objectives for Crown portfolio management.

The policy implications are likely to differ depending on what factors are considered relevant for welfare analysis. However, there are a number of general conclusions that can be drawn from the analysis:

- the Crown should be risk-averse (ie, *ceteris paribus* the Crown should prefer a less volatile portfolio to a higher volatility portfolio);
- the Crown should eliminate diversifiable risk as long as it can be achieved at low cost; and
- there is a reasonable case for a low-risk overall balance sheet but this does not necessarily imply a low-volatility financial portfolio.

In addition, there are a number of general empirical results that appear to be robust, but which should be subject to further empirical testing:

- there is a reasonably strong case for issuing long-term domestic debt;
- foreign currency debt tends to exacerbate balance sheet volatility; and
- foreign currency assets are expected to dampen balance sheet volatility.

Further work should concentrate on two areas:

- explore the feasibility of developing a policy framework to guide decisions on balance sheet composition; and
- undertake empirical work to improve our understanding of the dynamic behaviour of the Crown's balance sheet.

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